

Itek Laboratories  
A Division of Itek Corporation  
Waltham 54, Massachusetts

Date: 15 March 1962  
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Final Report Phase I  
of  
Itek Project Number 9040

BT-1413  
TOP

I. INTRODUCTION

1. General

This report covers the effort expended during the period 19 February through 15 March 1962 on Itek Project Number 9040.

Several preliminary design meetings were attended and the results of these meetings are currently being incorporated in the present system design.

Items mentioned at these meetings (wooden mockup, structural mockup, qualification program, special test equipment and ground support equipment, DRT modification, indexing cameras) are being investigated for their impact both price-wise and schedule-wise on the current program.

Overall progress based on the latest PERT schedule has been most satisfactory with all items currently on schedule. However, several approaches have been suggested. These approaches and interfaces must be firmed up in the immediate future for work to continue in an efficient manner without undue schedule slippage.

A summary of the progress on the major elements of the Camera system is outlined in the following paragraphs.

II. PROGRESS SUMMARY

1. Optics

A design investigation is currently in process to evaluate the feasibility of improving the optics for "downstream" units. The designs being considered are a 66" f/5 improved triplet and an increased aperture triplet of f/4.5 or possibly f/4. Consideration is also being given to an increase in barrel length for ease of manufacturing.

NRO review(s) completed.

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## 2. Film Transport System

System design is complete. Computer studies indicate that the system will provide adequate accelerations. Functional diagram and system schematics have been released.

2.1 Take-up Spool: This design based on the present concept has been finalized utilizing several major existing parts and is ready for sign-off and detailing.

2.2 Supply Spool: The present supply spool design consists of a slightly modified take-up spool mounted on a frame that is compatible with present structural design. Relocation of this spool in the new concept requires new structural interfaces and a different method of mounting. This effort has been halted until more structural information is available.

2.3 Spool Drive: The spool drive mechanism has been modified to reduce the spool core outside diameter. The spool drive system is currently being finalized and will be ready for detailing in the immediate future.

## 3. Shutter and Platen

3.1 Shutter: The overall block diagram of the shutter has been completed and released. The slit will be contained in a "bug" driven by stainless curtains. The curtains will be held in tension by a spring-loaded tape between the curtain drums.

The shutter drive servo has been breadboarded and tested. A few problems were encountered with the couplings on the tachometer and potentiometer. A satisfactory coupling has been found for the potentiometer. The first attempt to mount a tachometer on a motor was unsuccessful. A new method of attaching the tachometer is being investigated. The breadboard had a bandwidth of 25 cps and a stiffness of 0.02 in./oz. This performance should give satisfactory following of the lens. The servo position will be biased with the V/h command to assure zero following error between the lens and shutter during photography.

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3.2 Platen: The design layout of the platen is approximately 30 percent complete. However, a design change on the inboard profile has caused a temporary stoppage to the design layout of the platen. An investigation is currently underway.

The assembly layout of the gear train for the platen has been completed and checked by engineering and is now ready for detailing.

A reworked 1316372 AC tachometer was tested and found to be 90 degrees out of phase and the sensitivity greatly decreased. Another tachometer was obtained, and an adapter between the tachometer shaft and motor was made. This assembly has been tested and proven to be satisfactory.

#### 4. Scan Drive System

A lens drive assembly has been reassembled mechanically and is currently undergoing electrical modifications.

The system design for the lens scan servo is approximately 75 percent complete. Computer study of the system is currently underway. This unit will be run for development tests. The lens scan servo is currently being tested with the latest amplifier circuit. Many details have been released for manufacture.

#### 5. Weights and Structures

Considerable work was expended on the internal structure configuration and several preliminary layout drawings were in process. However, due to later information received, as a result of preliminary conferences, work in this area is now progressing as follows:

a. Configuration studies of three new versions of a 24-inch longer unit with the supply spool mounted on the centerline (no skew rollers) using both 50-inch and 60-inch diameters and 20-degree cone angle are now underway. Layouts of same are currently in process.

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b. Configuration study of intermediate length unit (6-inch longer) with 20-degree cone angle is also underway. A preliminary layout is currently in process.

Work on the detail fittings for lens mount, mirror drive, mirror trunnion and hoisting provisions for the lens mirror structure has been completed. Final design control drawing of this area awaits completion of overall arrangement.

For comparison of new versions, the weight report has been updated.

#### 6. Data Block and Instrumentation

After engineering investigation it now appears that the data block design used on a previous program will be suitable for use in the current program. The information to be included is as follows:

- a. Binary frame count
- b. Camera number
- c. 30 bits binary time - from customer-supplied clock.

Under consideration is two channels for digitizing roll and pitch attitude for display.

#### 7. Roll Steering System

A preliminary control system has been designed and breadboarded. This breadboard is currently undergoing test.

#### 8. Mirror Control System

The system design and a schematic diagram for the mirror assembly have been completed.

#### 9. Subsystem Amplifiers

Design of an amplifier package suitable for all five (5) applications in the camera is complete.

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Breadboard versions of the amplifier have been successfully used with the shutter and the lens scan.

Two prototype units in the proposed final packaging have been built and are being tested in the lab and under vacuum for thermal design information.

Methods of mounting for optimum heat transfer from the output transistors are being studied.

10. V/h Generation

Finalization of design in this area depends on currently unspecified interface signals.

11. Wooden Mockup

A wooden mockup to be used by engineering and packaging to aid in space allocation for assemblies, components, and cabling is currently under construction.

12. Fixtures

A design layout of the fixture used to align the platen has been completed. Preliminary engineering studies have been started on the overall assembly fixture as well as the DRT dolly and aligning fixtures.

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